

TRANSACTIONS
OF THE
PHILADELPHIA ACADEMY OF SURGERY.

Stated meeting held May 6, 1907.

The President, JOHN B. ROBERTS, M.D., in the chair.

THE ANNUAL ADDRESS IN SURGERY.

DR. EDWARD MARTIN delivered the annual address for 1907.

SURGERY OF THE VASCULAR SYSTEM.

A symposium on the above subject was conducted, consisting of the following papers:

I. Ligation of the Ductus Arteriosus, by Dr. John C. Munro, of Boston; II. Arteriotomy for Embolism and Thrombosis, by Dr. Francis T. Stewart; III. Technique of Blood Vessel Suture, with Demonstration of Specimens, by Dr. J. Edwin Sweet; IV. Endo-Aneurismorrhaphy (Matas), with Report of Two Cases, by Dr. Charles H. Frazier; and V. Endo-Aneurismorrhaphy (Matas) with Report of Two Cases, by Dr. John H. Gibbon.

For these papers, see pages 335-366.

DR. GEORGE E. BREWER, of New York, said that for years he had been interested in this phase of surgery, particularly the Matas operation, and has long wished to hear the results of that procedure as detailed in the instances just reported. He has never carried out the procedure himself as none of the cases in which he expected to employ it proved suitable. He has, however, met with a case similar to one of those described by Dr. Frazier. It was one of aneurism of the first part of the femoral artery and the vessel above and below was ligated with the expectation of later excising the sac. Ten days later he began excision but found excessive hemorrhage, due, as in Dr. Frazier's case, to

two or three branches in the wall of the sac. Hemorrhage was with difficulty controlled. Such vessels are apt to be found in aneurismal sacs in this location. Dr. Munro's suggestion regarding the ligation of the ductus is to be thought of in suitable cases. If the diagnosis can be made the treatment is rational as the hopelessness of these cases is well known.

Dr. Brewer's own work has been experimental, based on efforts to close accidental wounds of arteries. The first accident was the wounding of an external iliac during a hernia operation, the suture being introduced from below upward instead of downward. Bleeding was profuse and it was found that a Hagedorn needle had passed through the vessel. Two attempts were made to suture the artery, in which the wound was one-fourth inch long. Tension was high and the sutures tore out each of two times they were inserted. The vessel was then ligated. Fortunately there was a free collateral circulation which maintained such satisfactory conditions that the patient never knew he had more than a hernia operation.

The second case was one of cancer of the breast in which a house surgeon who was operating plunged a knife into the axillary artery. The vessel was sutured and apparently no thrombosis formed. Several mattress sutures of fine silk were inserted with a round needle, the walls of the vessel being so thick that the intima was probably not wounded. Six weeks later the clinical result was good. This is the only artery he has ever successfully sutured. These accidents led to the experimental work reported a few years ago, in which he used for wrapping the vessels, an elastic plaster made up of a strip of very thin gum, coated with an adhesive material like that used in the zinc oxide plaster. Experiments were made on a large number of animals and some of the results were good. He regards the method as worthy of trial in accidental wounds of the arteries.

DR. JOHN B. MURPHY, of Chicago, described a case of double embolism involving the right femoral below Poupart's ligament and the left common iliac, the case being one of sepsis and malignant endocarditis following extraction of a tooth. Removal of the obstruction in the legs was thought of but embolism of the brain caused death before the operation was undertaken.

The work of Dr. Sweet is appalling from the standpoint of the time and labor necessary. Dr. Murphy is pleased with the results obtained, not only in the technical work but also in the train of thinking in respect to thrombosis in arteries and veins. From this one comes finally to the practical results of arterial work shown in the cases of Frazier and Gibbon; the work from 1889 on by Matas and others is showing results. In analyzing the work done in the suture of arteries it may be reduced to three essential methods: first, end-to-end suture; second, end-to-end implantation; third, suture by mechanical support. The third, promulgated by Abbe, was not a bad idea.

For practical suturing of vessels two things are essential; there must be no immediate hemorrhage and no immediate thrombosis. Gangrene results from immediate primary ischemia. If ischemia come on gradually there is no thrombosis, this being shown clearly by specimens in the British museum. If therefore we can devise an operation that will tide over a few days, we will succeed. In an aneurism where it is impossible to employ the Matas operation if we can produce a gradually occluding endarteritis in the proximal vessel the lesion will be cured. Most of the work upon arteries previously reported was too coarse. The greatest element in the production of endarteritis is trauma and not infection; where the artery is pinched is the point of greatest danger. Carrel's great care in handling and suturing the vessels is his dominant point, and this adds more to his success than does any other feature of his work.

DR. J. C. HUBBARD, of Boston, said that his experience in arterial surgery had been obtained by doing an arterial venous anastomosis in two cases for reversal of the circulation.

The first case, already published in the *ANNALS OF SURGERY* for October, 1906, was that of a man of 80 years with senile gangrene of a portion of the right foot. Physical examination showed him to be a decidedly senile old man with atheromatous arteries and a systolic heart murmur. No pulsation could be felt in the right dorsalis pedis artery. In May, 1906, he was operated upon. The femoral artery and vein were isolated in Searpa's triangle below the origin of the profunda and divided between Crile's clamps or elastic ligatures. The upper end of the artery was then invaginated into the lower end of the vein and the distal end of the artery into the proximal end of the vein.

A complete reversal of the circulation was thus established. The technique of the invagination was as follows: Three double headed sutures were passed equally distant through the entire wall of the artery from inside out. The needles were then passed into the lumen of the vein about a quarter of an inch and at this point through its wall. When these sutures were drawn tight the artery was drawn into the vein. Reinforcing sutures including only the outer portion of the arterial wall were then placed here and there to catch the edge of the overlying vein to the artery. Number 1 Pagenstecker thread was used for all these sutures. When the controlling clamps were removed there was no leaking at either suture line and weak pulsations could be felt in the vein for a short distance below the anastomosis. There was absolutely no shock shown by the patient and recovery from the operation was satisfactory in spite of the fact that the senile condition of the patient made it difficult to keep him in bed or a dressing on the wound. After the operation the appearance of the leg did not change. There was no oedema, dilatation of the veins or cyanosis. The gangrene which existed before the operation spread a little and then a line of demarkation formed. When the foot was later amputated at the point of election on the tibia both tibial arteries contained arterial blood. The stump healed satisfactorily but slowly. In March of this year, ten months after the operation he saw the patient. The stump was well supplied by the circulation and there was no difference in appearance or size of this leg and the unoperated one.

Clinically this case was most successful but the exact meaning of the presence of arterial blood in the tibial arteries at the time of the amputation he did not know. It seems that the arterio venous anastomosis must have increased in some way the amount of blood in the leg, for it is hard to believe that an amount of blood so small as to permit gangrene of the foot would be sufficient to nourish for ten months an amputation stump made only a short distance above the gangrenous area and had clots formed at the sites of the anastomoses it seems most probable that the gangrene would have extended up the leg instead of remaining localized.

The second case was that of an old woman of 60 years with senile gangrene of the foot and a portion of the leg. The arteries were atheromatous. She was operated upon during February of

this year. The femoral artery and vein were divided as in the first operation. The artery was much calcified and was so hard that some force was necessary to drive the needles through it and so brittle that the stitches tore out most easily. The intima formed a distinct lining to the vessel and was much like a second smaller tube inside a larger one. These characteristics of the wall complicated the technique immensely as the attempt was to make the anastomosis according to Carrel's method, turning the walls so that at the suture line intima should come in contact with intima. The artery was so much like a pipe stem that this was impossible although a conscientious attempt was made. The ends of the artery and vein were therefore cut off freshly and the artery invaginated into the vein as in the first case the only difference being in the use of vaseline to smear the ends of the vessels. The distal end of the artery and the proximal end of the vein were then ligated. The vein pulsated after the controlling clamps were removed. Pagenstecker No. 1 was used. There was no shock and no change in the appearance of the leg. Ten days later it was necessary to amputate above the knee for the gangrene which had been present before the operation. During these ten days it had become more pronounced but its limits had extended only a little. During the amputation the anastomosis was cut down upon and removed. The artery was found filled with a loose, easily detached clot. This case was therefore a distinct failure.

From these cases he believed it to be perfectly evident that there is no danger in continuing investigations further as there is no shock to the operation. Carrel's method is not applicable to a certain number of the cases where the operation is done on old persons with atheromatous arteries. On young persons and experimental arteries it doubtless is most satisfactory but as the operation has been proposed to cure conditions dependent upon lack of circulation in the extremities some other technique must be found as practically all cases, except perhaps some due to trauma, will necessarily be in elderly persons. An objection which may be raised to the invagination method as employed in the above cases is the fact that the divided end of the artery leaves a certain portion of its wall in the blood stream uncovered by intima which favors clot formation. This method was introduced by Murphy in 1897 (*Medical Record*, Jan. 16) for the

repair of the continuity of an artery and was recommended only after experimentation. The slight modification of invaginating the artery into a vein instead of into another portion of the same artery would seem not to invalidate the method. However, as at present this objection might be raised, he was working on some scheme to obviate this difficulty, but as yet could not report results. Two ways had occurred to him. One is by smearing vaseline or some other substance onto the cut end of the invaginated artery to keep it out of the blood stream. The other way was suggested by the appearance of the arterial wall in the second case where the intima formed a distinct layer inside the others and one which remained intact when the others cracked away from it. He had thought that it might be possible to cut the outer layers of the artery a quarter of an inch or so back of the intima and thus leave a greater length of intima as a cuff, the back of which could be covered with vaseline so that when invaginated into the vein it might stick to the venous wall and cover over the cut end of the outer portion of the artery.

DR. ROBERT H. M. DAWBARN, of New York, said Dr. Sweet's statement, that silk sutures were everywhere admitted to be the best, he must take exception to. A good many years ago Dr. Willy Meyer, of New York, proved by experiments that linen, cotton, and silk threads are tolerated equally well by the body tissues.

Of these linen is, size for size, the strongest, and is not seriously weakened by boiling; whereas silk is distinctly weakened.

For these reasons Dr. Dawbarn said he has not for years past used silk in surgery for any purpose whatever. In bowel and stomach work he has long advocated linen sutures—probably for ten years; though he would not bury it elsewhere in the body, except when exceedingly fine in diameter, as in Dr. Sweet's work upon arteries.

By asking at any large department store for such linen thread as is used in mending Renaissance lace, one can get size one thousand—which is as fine as can be used, practically, in vessel-work. It would seem to Dr. Dawbarn that if one employs women's finest sewing needles, removing the temper by heat enough to allow of curving them, and avoids having the thread

pass through the intima, so that it does not touch the blood current nor invite clotting, it might be a help. And yet Dr. Dawbarn did not wish to claim the least personal experience of work, such as that of Dr. Sweet, and would defer to his opinions in these matters.

Regarding Dr. Brewer's ingenious device for control of an important artery wounded accidentally at operation, Dr. Dawbarn said he must repeat his criticism offered upon the occasion when Dr. Brewer presented before the New York Surgical Society the results of his experimental work upon dogs. These experiments were very ably done, and the results satisfactory. To Dr. Brewer belongs the credit of the thought, and Dr. Dawbarn merely suggested a different material to wrap about the artery after its suture, and before allowing the current to be resumed; namely, Cargile membrane. This is always at hand, and, whether the adhesive or non-adhesive, will be equally satisfactory. It is very strong. After wrapping the vessel several times the final edge is sewn to the layer just beneath.

Being absorbable tissue it will in time disappear. As to the special kind of thin surgeon's rubber plaster advocated for this purpose by Dr. Brewer the life of rubber plaster is short, at best, and nobody would be likely to keep this specially thin kind on hand, and renewed often, to meet so very rare an accident. Also, being non-absorbable, it is capable at times of causing trouble later; becoming finally an irritant, however thoroughly aseptic it may be.

Dr. Dawbarn has tried upon two dogs' common carotids the gold-beater's skin adhesive plaster as just advocated by him, and with excellent results. The specimens, with others to be obtained by later work, he hopes to show in time.

DR. DUDLEY P. ALLEN, of Cleveland, said his first experience in suturing vessels was in connection with wounds of the veins. The first case occurred between ten and twelve years ago. It was a wound of the longitudinal sinus, the length of the wound being $\frac{3}{4}$ of an inch. The wound occurred in an operation upon the brain and it was closed by a continuous suture of fine silk, the skull was re-placed, and healing took place without any complications.

There is one condition which has not been mentioned in

which suture of the vessels might prove to be of great value. Occasionally sarcomata develop in the popliteal space, being unattached to bone. It may be impossible before operation to tell whether the sarcoma surrounds the popliteal vessels or has pushed them to one side. If the vessels are surrounded, it may be necessary to divide them in order to remove the growth. Under such conditions, if a suture of the vessels could be successfully made it would be an operation of very great value. In a recent case it was necessary to divide the vessels and the operation was followed by gangrene of the leg which required amputation. Could an anastomosis have been made the leg might have been saved.

DR. J. F. BINNIE, of Kansas City, said that in a typical case of sacculated aneurism with one opening of moderate size he closed this opening with a suture and then obliterated the sac in the Matas' fashion thus performing a reconstructive operation although he did not at the time recognize the fact. In other cases, named by Matas fusiform aneurisms, there are two openings into the sac, these two openings being connected by a groove or strip of comparatively healthy vessel wall, along the wall of the sac. Such aneurisms are *not* fusiform, they are sacculated, only a narrow strip of one side of the vessel being diseased and constituting the sac. In this class reconstructive operations are of much value; there is sufficient healthy tissue to give a good prospect of success. Even if complete success is not attained, i.e., if the newly created arterial tube becomes obliterated, this obliteration may take place slowly enough to permit the circulation being kept up while collateral circulation is being established. In true fusiform aneurism the whole circumference of the vessel wall is diseased—no healthy material remains out of which to construct an artery—hence in these cases the ordinary Matas' obliterative operation is proper and easy, the reconstructive operation is out of the question.

DR. MUNRO, in closing, said he found in one case the same trouble experienced by Dr. Stewart. There was thrombosis of the femoral resulting from a fracture-dislocation. The clot stuck to the vessel wall and the artery was then opened below the thrombus and dislodgement attempted by hydrostatic pressure, but this was also unsuccessful.

DR. SWEET, in closing, said that the needles employed in arterial suture were so fine that if one attempted to sterilize and bend in a flame the steel would at once burn and be ruined. Regarding different suture material, silk probably has the finest individual strands and hence is to be considered better. A point to be considered in the case of arterio-venous anastomosis is that time is gained for the establishment of a collateral circulation.

DR. FRAZIER, in closing, said in answer to a question by Dr. Dawbarn regarding the control of hemorrhage from the femoral in operating upon aneurism, that the latter's suggestion to use McBurney's technic in securing a bloodless amputation by opening the abdomen and compressing the common iliac against the psoas was worthy of consideration.

DR. GIBBON, in closing, said regarding Dr. Stewart's suggestion that the vein be substituted for the artery, that in looking up the literature of the subject he had discovered the report of a case by Goyanes,¹ of Madrid, in which that suggestion had been put in practice. The popliteal was divided distally and the vein substituted for the artery, the expedient proving a success.

¹(*Siglo Médico*, Sept. 8, 1906.)